CHAPTER 2
REVIEW OF LITERATURE- TRADITIONAL SCRIPTURES

“(केन) कि तज्जानं एन अश्रुंभ श्रुतं भवति,
अविज्ञातं विज्ञातं भवति,
अमरं मरं भवति।” ( छान्दोग्योपनिषद् )
kena kim tajñāna yena aśruta śruta bhavati
avijñāta vijñāta bhavati
amata mata bhavati | chandogyopani ad |

“Which is that knowledge by which the unheard becomes heard, the unknown becomes known and the unaccepted becomes accepted?”

2.1 AUTISM ACCORDING TO AYURVEDA

Ayurvedic medicine is one of the world’s oldest and most complete systems of natural healing which offers comprehensive and holistic treatment for physical and mental disorders. It promotes physical health and healing of the mind through diverse methods focused on treating all the physical, psychological, and spiritual aspects of each individual affected with physical and mental disorders.

Ayurvedic medicine offers the opportunity to understand the nature of the mind in a way that is completely unique and quite different from the Western Psychological and Psychiatric medicine models. “Ayurvedic medicine views psychotic disorders (unmada) as the imbalance of energies on an inner level. According to Ayurveda and occult science, behind the gross physical body, there is a subtle or astral body composed of the life-forces, emotions and thoughts. The “Astral” is a subtle form or underlying energy pattern of the physical form, from which the physical body is produced. (Frawley, 2004[22])

Ayurveda, the health science of India, does not refer to autism as a specific entity under classification of diseases. It is not mentioned in any of the major ayurveda texts
including Charaka Samhita (चरक संहिता) and Kashyapa Samhita( काष्यप संहिता) [23]. However, certain signs and symptoms seen in an adult autistic individual are described under Unmada (उन्माद). There is no description of childhood autism. The entire description may be grouped under Schizophrenia (present day terminology). Some of the features that we now recognize as ASD in children are described under the term with different types of seizures of childhood epilepsy.

2.1.1 “Autism “,in Ayurveda can be correlated to Balagraha/ Jada/ Unmada.

Definition of Autism in ayurveda can be- Any imbalance in the form of bhramsa of dhi, dhrti or smrti, whether collectively or singularly; if caused, an indulgence in unwholesome action, it is termed as prajnaparadha. Its direct consequence is sarvadosa prakopa and various types of derangements in buddhi as well as in physiological functioning and ultimately it becomes an important causative factor of the diseases.

Acarya Caraka has enumerated the causative factors of all the diseases in a nutshell under the three heads viz. asatmyendriyartha samyoga, prajnaparadha and parinama. Out of these, highest significance has been attached to prajnaparadha (Ca. Su.1/54; Sa. 1/102,109).

A consolidated specialty of prajnaparadha has been mentioned by Caraka that the visama or anucita (improper or imperfect) knowledge and visama pravrti is collectively known as prajnapradha and it is an object of manas.

Other than the three types of buddhi dosas which have been held responsible in causing various types of pathologies, there are certainly other types of buddhidusti, which has been discussed at various places in Ayurvedic classics in a scattered manner. Generally speaking these buddhi dosas may be identified as purely psychological derangement. So, for psychological type of buddhidusti ,examples of unmada, apasmara, mada, murcha, sanyasa, moha etc. can be cited. Acarya Susruta has mentioned different types of buddhidustis which are psychological viz. krodha, soka, bhaya, harsa,visada, ersya, abhyasa, dainya, matsarya ,kama, lobha etc. and they have originated from iccha or dwesa (Su. Su.1/25). On screening of the Ayurvedic references , the following types of buddhi dushtis may be identified.
2.1.2 Sthayi Buddhi Dusti:

Person and specially children, may be witnessed having a defect in the buddhi right from birth and that generally extend to the end of life in greater or lesser degree. Various factors that may be responsible for sthayi buddhi dushti may be:

1. Complete buddhi nasa or abuddha,
2. Buddhi jadata,
3. Buddhi mandya

Out of these a complete buddhinasa or abuddham is the condition where the children are totally idiots and this condition is supposed to be incurable. (Ca.Sa.8/21; As.Sm..Sa. 2/37).

Jadata and buddhimandya are the conditions where the mental development is found to be impaired, children either understand little or understanding is delayed, or there is no sharpness in the intelligence. This condition, by appropriate treatment, may be corrected to some extent. Perhaps with this ideology, various buddhi sharpening recipes e.g. Medhya rasayana etc. have been prescribed by the ancient Acaryas. Nirbuddhi is also a condition where the absence of dhi, dhrti and Smrti is witnessed. However, such children recognize the pain and desire or satisfaction of natural urges. These persons may also be corrected by appropriate treatment to some extent, just to enable them partially adjusted in society.

2.1.3 Asthayi Buddhi Dusti:

The other type of buddhi dusti, which may be of temporary nature, is acquired through various narcotic substances and dusta ahara. This will be evident from the reference given in the context of madatyaya as well as the definition of madaka substances.

Accordingly the asthayi buddhi dusti may be termed as under –

1. Buddhi lopa
3. Samjna sammoha
4. Samjna akulata
5. Manas cesta aksepa
6. Dhi vibhramsa
7. Smrti apagama

All these conditions are caused either due to excessive consumption of madya or rakta dusti or the tridosa. Giving appropriate treatment prescribed for madatyaya, mada, murcha, unmada and apasmara may correct these conditions if they are of very acute nature and necessitate emergency attention. However, in mild conditions, as soon as the last remnants of narcotics are excreted out of the body, the individual may regain the normal state of the dhi, driti and smrti. Only a beneficial diet has to be arranged and a little psychotherapy has to be applied. Prajnapradha is also a temporary type of buddhidusti, if it is caused by the above mentioned causative factors and the same may be corrected by the appropriate treatment.

2.2 Aetiopathogenesis of Jada

Jada is a condition of buddhi, where there is impaired perception, retention and recollection of the knowledge. It has been mentioned by Acaryas that atiyoga, mithyayoga and hinayoga of any entity as kala, buddhi, indriyartha can produce this disease. Even Acarya Caraka has separately emphasized that atiyoga, mithyayoga or hinayoga of the manas together with buddhi can make the etiology of the disease. Here, in jada also, there is poor genesis of knowledge due to hypofunction (hinayoga) of manas and buddhi (with its sub component i.e. dhi, dhrti and smrti).

The genesis of knowledge is not a mono faculty phenomenon. Many other factors play their role equally. The indriyadhithanas are first entity, which receives the objects, but for the production of knowledge the participation of indriyas and manas is necessary; in the process of the genesis of the knowledge buddhi becomes a functional state. But indriyas, buddhi and manas can not work absolutely, they are also dependent on pranavayu and udanavayu. Sadhaka pitta, alocaka pitta (buddhi vaisesika), avalambaka kapha and oja have been described in the Ayurvedic classics. Hypo activities of all these entities can impress upon the hypo function of buddhi.
Keeping this in mind, pathogenesis of mandabuddhitva can be described as follows:

The manas and buddhi are derived from atmaja and satvaja bhava and their qualities depend upon the deeds of the previous birth and the ratio of satva, rajas and tamas guna at the time of fertilization. The higher concentration of tama guna, either due to previous karma or other conditions at the time of fertilization, can have an impact on the normal physiology of buddhi, resulting in its hypo functioning and the foetus affected is born mentally deficient. This condition may also be possible in case of abnormality of bija, bijabhaga or bijabhaga avayava, especially the part which is responsible for buddhi.

Various etiological factors like dishonored longings of a pregnant woman, excessive consumption of vata vardhaka ahara, intake of alcohol, excessive sleeping by a pregnant lady vitiate the dosas (the vata dosa mainly). This provoked vata either directly reaches the foetal heart through nabhinadi or may form an avarana i.e. pranavrtta Samana, which results in jada or aggravated vata, vitiates kapha and the two reaches the foetal heart, through the nabhinadi. The dosic predominance in balyavastha is that of kapha; hridaya too, is a seat of kapha dosa. Thus vata

along with kapha obstruct the functions of entities having their seat in the hridaya such as manas, buddhi, pranavayu, udanavayu, sadhaka pitta, alocaka pitta (buddhi vaisesika) and oja. On the other hand, kapha itself is dominated by tamobhava. The hypo function of all these entities and higher concentration of tama guna can manifest into the hypo functioning of buddhi.

During delivery, if there is any trauma (abhighata) especially on head, which is also a seat of indriyas, it may effect the indriyas leading into hypo functioning of the buddhi. In the postnatal period, kapha milk feeding to a child provokes the kaphadosa and this aggravated kapha creates sanga (obstruction) in the manovaha srotas in the hridaya which is the seat of buddhi and its functional units. It results in impaired genesis of knowledge and causes jada.
2.3 MANAGEMENT

In Ayurveda, not only the physical disease, their prevention or treatment are given importance, but also the mental diseases and their prevention and treatment have been given equal importance. In this context, various rules of mental hygiene such as ‘sadvritta’ and various drugs such as Medhya rasayanas have been prescribed by Ayurvedic Acaryas. Regarding the psychological disorders of a child, Acaryas have indicated to prevent the psychological disorders of a child, not only since birth but also since before birth and various drugs have been prescribed to stimulate the intellectual ability of a child. In this direction, Ayurveda has thought on step further. Even during the rtukala, women have been advised to follow certain codes to have intelligent progeny.

All these measures can be divided into two groups as under –
1. Preventive Measures
2. Specific Measures

2.3.1 Preventive measures:
They can be further subdivided into –

a). Before conception

In Ayurveda, the consanguineous marriage has been prohibited, not only by Caraka and Susruta, but even modern sexologists and biologists have described it. Acarya Bhela has clearly mentioned that to prevent the disease of medhadi the consanguineous marriage should be avoided. Before going for conception, the Acaryas have prescribed an extensive and exhaustive list of restrictions and rules for a woman which may affect the child’s psychology. To have a healthy and intelligent progeny they should be followed strictly.

b). Prevention during Pregnancy

In the context of Garbhopaghatakara bhavas, Acarya Caraka has advised to avoid various dietetic regimens, habits and trauma; otherwise they can lead to abortion of birth of a child and various psychological disorders e.g. excessive sleep. An excessive consumption of alcohol by a pregnant woman may deliver an idiot with poor memory or hyper activated or mentally impaired child. In the fourth month of pregnancy, the
foetus heart which is the seat of consciousness, becomes active, hence it expresses its desires through the mother, this state is called dauhrda. The wishes and desires of Dauhrdini, if not honoured and gratified, may lead to various congenital abnormalities such as kubja, khanja and jada a mental derangement, and therefore importance should be given to the fulfillment of dauhrdya.

c). **Prevention during Delivery**

During the second stage of labour, Susruta has pointed out that, on not following the instructions for bearing down the pains by an asannaprasava, women may lead to congenital abnormalities such as trauma etc. and it may result in psychological abnormality.

d). **Prevention during the neonatal period of child**

In this respect, in Ayurvedic Neonatology, there are two terms viz. Jatakarma and Jatamatra. The jatakarma is a samskara that should be performed after establishment of the respiration in a neonate. During this madhu, ghṛta and swarna in an equal proportion with chanting of the Vedic mantras are fed to the child for promoting medha and balā. The basic aim behind this jatakarma is to stimulate the intellectual ability of the child from the neonatal period. The other term, jatamatra, refers to the stage of recently born infant and for protection of child from infections, and cleansing methods are adopted to establish the normal life. At the same time, prana pratyagamana (resuscitation) in the form of physical stimuli, mukha sleshma shodhana etc. are carried out; the aim of these methods being to provide pranavāyu in sufficient quantity to prevent the asphyxia which is a common cause for mental abnormality and sometimes for the untimely death of the infant. Further, the Acaryas have also described various other necessary methods to prevent the physical and mental disorders. They are raksakarma, dhupanakarma etc. Various dharana drugs have been mentioned to improve the ayu, medha and smṛti.

### 2.3.2 Specific Treatment:

In Ayurveda, various remedies have been described by the Acaryas to improve the mental ability. Acarya Caraka has mentioned four Medhya rasayanas which are
Mandukaparni, Madhuyasti, Guduci and Shankhapushpi. Acarya Kasyapa has mentioned some lehas - Kalyanaka ghrta, Brahmi ghrta, Pancagavya ghrta, Samvardhana ghrta.

Acarya Vagbhata (A.Hr.Ut1/47-48) has advocated four yogas to promote the medha, bala and varna of a child. They are as under –
1. Fine powder of Swarna with Ghrta, Vaca and Kusta.
2. Matsyaksi, Swarna, Vaca, Ghrta with Madhu.
3. Arkapuspi, Ghrta, Swarna and Vaca with Madhu.
4. Swarna curna, Kaidarya, Swetadurva and Ghrta with Madhu.

Acarya Susruta opines that continuous practice of learning i.e. following abhyasa, also improves medha and buddhi. This principle of Susruta can be very fruitful for the mentally deficient child in form of special education and teaching.

Apart from these drug therapies, there are certain other methods of improving the memory about which Acaryas have discussed in different contexts. One of them is abhyasa, which refers to continuous practice. Similarly samadhi and yoga also sharpen the memory and elevate the level of buddhi. This principle of Susruta is very much important and is a fundamental factor behind all the learning processes.

2.4 Definitions of unmada

The following excerpts from Charaka Samhita explain several features that seem to point to the symptoms in ASD under the heading of Unmada: Dhee Vibhrama (धीविभ्रमं) The intellectual confusion, Paryakula Drsti (पर्याकूला दृष्टि) unsteady vision, Satwa Pariplawa (सत्वपरिप्लव) fickle mind, Adheerata (अधीरता) Lack of courage, Aabadha Vaaktwam (अबाध वाक्त्वम) indistinct and incoherent speech, Hridayam Cha śunyam (हृदयं च शून्यम) lack of insight or imagination or inability to process sensory information. These are the general signs and symptoms of Unmada.

2.4.1 Types of Unmada

धीविभ्रमं: सत्वं परिप्लवः
पर्याकूला दृष्टिधीरस्तः च।
अबाधवाक्त्वं हृदयं च शून्यं
Such a person with indecisive mind becomes incapable of experiencing emotions, conducting himself appropriately and his memory (स्मृति), intellect (बुद्धि), and cognition (संज्ञा) get altered (sloka 6, chapter 9).

Further Charaka explains the term Unmada as,

Unmada refers to indiscriminant knowledge. The texts mention that in unmade, all the three major cognitive functions including Buddhi-the discriminatory knowledge, the manas-perceptual ability of the mind and smrti-the memory of the knowledge about the objects and experiences of the past, are all disturbed.

In Charaka Nidana, the state of Unmada is further explained under the following sloka:
Unmāda means altered function of Manas, Buddhi the discriminatory power, samgna (संज्ञा) -the sense organ perception, Gyana- (ज्ञान) the knowledge, Smrti (स्मृति)-the memory, Bhakthisheela (भक्तिशील)-devotion or any form of emotional expression and Cheśta (चेष्टा) -physical activity level with hyperactivity.

In the ancient texts of Ayurveda, there are detailed descriptions of mental disorders known as “Unmada” and schizophrenia can be correlated with many of the types of “Unmada”. Ayurveda physicians describe schizophrenia as a disorder of the mind caused by the doshas (pitta, kapha, and vata) moving in the wrong paths due to increased toxicity.

Three types of insanity (unmada) are described under Wind Insanity (vayu), Choleric Insanity (pitta), and Phlegmatic Insanity (kapha). Conjunctive Insanity (tridosha) is a combination of all three.

Frawley [22] states that “Wind gives rise to the following: an emaciated body; inappropriate lamenting, shouting, laughing, and smiling, as well as dancing, singing, playing music, talking, posturing, bursting out; repeatedly and tunelessly imitating the sound of a flute, veena, or other instrument; frothing at the mouth; constantly wandering about; ceaseless talking; using things which are not ornaments as decoration; trying to travel on things which are not vehicles; being greedy for food, but spurning it once it has been obtained; bulging, bloodshot eyes and illness after food had been digested.”

When vata is in excess, it makes us ungrounded, spaced-out and unrealistic. High vata in the mind manifests as fear, alienation, anxiety and possible nervous breakdown. There is insomnia, tremors, palpitations, unrest and rapid shifts of mood.

Choleric Insanity: (pitta) : Pitta results from indigestion, excess of hot, pungent, sour, or burning foods and liquids; excess pitta afflicts the heart of the person leading
to lack of self-control. High pitta in the mind causes agitation, irritation, anger, and possible violence.

Phlegmatic Insanity: (kapha) Phlegm causes the patient to lose any desire for food. It causes the patient to enjoy solitude. This aggravated kapha afflicts the heart, troubling the mind and memory.

Frawley et al [22] stated that “kapha evolves attachment and lack of motivation leading to depression, sorrow and clinging. The mind may be incapable of abstract, objective or impersonal thinking. There is lack of drive and motivation along with passivity and dependency”.

Conjunctive Insanity: (trisdosha) when there is a conjunction of all the sources of disease and symptoms, then the resulting problem is dreadful. Unmada is caused by the excessive presence of all three doshas.

2.4.2 Causes of unmada according to ayurveda

i. Diet

Causes of Unmada or autistic feature is described in Vimanasthana of Charaka Samhita 5th chapter in the following śloka.

viruddha duṣṭaśūcī bhōjāṇāni
unmādaḥṭuṣṭayāḥhṛṣṭपूर्वोः
मनोभिषिधातो विचमास्तिचे: ि
viruddha duśuci bhōjanāni
unmādaḥṭuṣṭayāḥhṛṣṭपूर्वोः
mano’bhīghuṭo viśamāścace ā ||

unmada is caused by consuming food or drink which are Viruddha (विरुध्द) (mutually contradictory), Dushta (दुष्ट) (polluted) and Asuchi (असुचि) (impure).

ii. Personality trait

Further causative factors mentioned for Unmada is explained in the following śloka:
Purusha is made up of small channels or micro channels called “SROTAMSI” (स्रोतात्मस्य) through which body gets nourishment. Disease occurs because of vitiation of these Srotamsi due to mithyahara. In the context of Unmada Samprapthi it is stated that the vitiated dosas (Vata, Pitta, Kapha) afflict the Manovahasrotas thus afflicting the intellect of a person having less of Sattva (Alpa Satva) resulting in Unmada.

iii. Maternal stress during pregnancy
Sushruta’s explanation about the cause of Unmada is explained in the following shloka

The desires of the fetus are expressed through the mother. Hence Dauhrda (दौह्रद) should always be fulfilled, because the negligence or non-fulfillment can cause
abnormalities or even death of the fetus. Whatever Dauhrda the woman desires, it should be fulfilled, except those that are likely to be injurious to the fetus.

2.5 Treatment of autism according to Ayurveda

Ayurvedic medicine is a holistic system of medicine that treats mental disorders from mild stress to severe condition, including insanity (psychosis). “Ayurveda employs whole series of yogic and spiritual therapies, including meditation, pranayama, mantra, prayers and visualizations”.

Ayurvedic treatment method reportedly works on balancing the biological humors through appropriate physical remedial methods of diet, herbs and exercise. One of the best Ayurvedic treatments for Unmada includes panchakarma chikitsa. According to Frawley[22], all psychological disorders, including psychotic disorders, reflect imbalances of the three biological humors. He says, “Health problems, whether physical or mental, are not merely personal problems, but energetic problems in the mind-body complex. They are not so much personal or moral failings as an inability to harmonize the forces within us”. The imbalances caused by the lack of harmony in our lives weaken the doshas that afflict the heart where there is less sattwa in one’s life and the mind. The disease develops through the manovaha srota that sends psychic energy to the mind.”

2.6 Treatment of autism according to Yoga

2.6.1 Concept of Body

Medical science studies the human body starting from complex DNA and RNA molecules forming the cells which are the fundamental units of life. Distinguishing the dead and living cells, it postulates that the functioning of cells with locomotion and reproductive capabilities makes at different from a dead cell which has neither of these activities. The study of dead cell is the subject matter for physics and that of living ones is biology. The laws of physics are well understood: The structure of the physical world is contained ultimately in Quarks or packets of energy and the famous equation \( E=MC^2 \) describes the quantum of energy contained in each matter. The functioning of physical objects follows certain well defined laws - Newtonian laws called classical mechanics for all normal macroscopic operations and Quantum mechanics describe
atoms, protons, neutrons and fundamental particles, the microscopic objects. Extremely high speed functions also follow laws of Relativity which boil down to normal Newtonian mechanics when the speeds are far away from that of light.

The living systems are studied in biology and the human systems in Anatomy and Physiology to understand the structure and functions of human body. The cells being the fundamental units of life, the study starts with them; they form the tissues which in turn come together to form organs and systems are the result of several complex permutations and combinations of these organs, tissues and cells. The systems are knit together to form the physical body. Modern physiology on the other hand looks at the functioning of these systems and the laws that govern them are not very well understood in terms of mathematics or those tools used in Physics. Biological system analysis is being attempted in the same way as physical system analysis.

If it be true that matter creates life, then it should be possible to create life out of matter. This was fervently attempted as Scientists and biologists did their lot in all top research laboratories to create matter by replicating a DNA and RNA molecules in 1970s and 80s. As we progressed successfully in replicating a DNA with all its complex structure, neither did it develop any characteristic of life nor did it show any feature of biological systems. By 1990s Scientists were convinced that there is something else which makes the dead cell live and probably it cannot be created by matter. Something like life should come from outside of matter, it looked.

2.6.2 Concept of Mind

According to modern medical science mind is nothing but functioning of brain cells. Contained in this definition is the matter based paradigm that everything originates from physical body and there is nothing apart from matter. The functioning of the brain which is nothing but mind can be measured by EEG, FMRI, etc.

As trials to create life out of matter failed, attempts to create mind out of brain through studies on brain functioning brought no success. A dead brain cannot make it function or replicate robotic brain powered by electrical power cannot bring the creative dimensions of mind. Seminars and workshops debated the question "Whether
brain can create consciousness? Can a robot equal a living brain? Can artificial intelligence with sophisticated software instilled in brain networks function as a living brain? Can brain as a super computer with its tremendous capacities of memory, software to control the whole body be indicative of emergence of consciousness? etc."

has clearly brought out the conclusion that consciousness is something different from mere functioning of brain. Consciousness as an independent substance is being considered and consciousness studies have started becoming more and more popular even in conferences on Physics.

2.6.3 Mind-Body Interactions

The mutual interaction of mind and body is well recognised today. A restless mind or an anxious mind can bring about sympathetic arousal through triggering of higher centers of the brain has become well known. Similarly the changes at body level bring profound changes in the mind as a patient with diagnosed cancer in the body has tremendous fear of death. A person with migraine cannot do his normal functioning using his mind. A disturbed mind reduces the efficiency of action. There are disorders of mind as neuroticism or anxieties which can bring lot of electrical and chemical changes in every part of the body including the cells and genes. A calm state of mind induced by techniques like Transcendental meditation can induce deep rest to the body can set its problems right, increase efficiency in action, promote positive health, etc. Similarly there are several Physical techniques as Asanas, Pranayama, Bandhas, Mudras, in Yoga which can induce calm state of mind. The interaction of mind-body is well known and mind-body medicine is becoming more and more popular than modern medicine which is based in the matter based paradigm.

2.6.4 Pancha Koshas

The concept of body in Yoga and spiritual lore takes us to deeper understanding than mere physical body. There are unseen layers of subtle and causal bodies which encompass the gross physical body. The panchakosha description contained in upanishads give a vivid picture of the five bodies which we all possess.
2.6.5 Consciousness based approach

In contrast to matter based paradigm described earlier, Yoga and Spiritual lore of Indian wisdom base postulates an opposite world perspective. According to Upanishads, Consciousness is primary and matter is the end product. From unchanging reality which is all fullness, with infinite power, knowledge, bliss and freedom brings out creation to show off as if, it’s innate power by its mere will. [ Asad va idamagra aasit. Sa tapo tapyata, sa tap[as taptva idam sarvam asrjata - taittireya] From pure consciousness emerge the five layers of its causal, subtle and gross manifests appear. They show up as five layers of consciousness - Anandamaya, vijnanana maya, Manomaya, pranamaya and Annamaya koshas. Creation, sustenance and destruction is the tri fold law that governs all layers of consciousness. It is known today that every day a billion cells get created and a billion get destroyed even in the physical body. Every minute we are different human beings.
There is continuous interaction of all the five Koshas. Any change in any of the koshas will reflect in other four koshas also. It is a single cognitive consciousness network, we can say. So it is not only body-mind interaction but all koshas working together as a single entity that makes all of us.

2.6.6 The Three Gunas

We are all made of permutations and combinations of three fundamental personality traits called Gunas. Tamas is the grossest which leads to inactivity, lethargy, drowsiness, sleepiness, slow learning, and resistance to any action in general, etc. Tamas is darkness and ignorance. Rajas, the next, are to shine. A person who is rajasik is brilliant, dynamic, full of energy and vitality, always ready to work and often becomes a workaholic. But his actions are all governed by selfish actions to amass wealth, acquire name and fame, etc. He is fully focused. But this type of action will lead him to great stresses and tensions which in turn can be the cause of modern lifestyle diseases. Sattva, the third is the best of the three. Sattvik personalities are having reduced selfishness, full of divine virtues - love, magnanimity, compassion, service attitude, sharing with others, etc.

New age lifestyle disorders as Asthma, Diabetes, cancer, mental disorders including Autism etc are essentially due to rajas; may be excessive Rajas. They are all related to our life styles. Rajasik life style of Speed and Greed bring great stresses which result in these diseases. The personality traits, Gunas, show up as Heredity tendencies which play a great role in all our actions and behavior patterns, They show up even in our life style. While this is an important subjective factor, there is also an influence of external forces which can modify the life styles effectively. For example, a born sattvik person can become rajasik under the influence of modern life style. Similarly if a proper atmosphere is created, a Rajasik sick person can regain his health and move towards Sattvik personality and change his entire lifestyle.

There is yet a third factor in all of us. That is freedom to change consciously. That freedom can be used to make or mar ourselves. If we use it constructively to improve ourselves, it becomes Yoga.
2.6.7 Gunas and Disorders

The modern life style disorders can be effectively handled using right techniques of Yoga. Similarly some disorders such as MR, CP, Slow learners, ASD, etc look as having all influence due to hereditary or born deficits. The modern life styles do not appear to influence them or we can say that the influence is marginal. However it is heredity on one hand and life style on the other hand which make the human system go out of balance called disease or disorders. They show up as imbalanced Gunas and Doshas in our Koshas.

Yoga goes deeper in its understanding of heredity as manifests of deeper personality traits of Tamas ,Rajas and Sattva at manomaya kosha. These traits descend down to Pranamaya kosha as Doshas and show up as disorders in the annamaya kosha, called vyadhis. And there is continuous interaction of freedom in all of us and these gunas every moment. Using our freedom we can change our Gunas effectively.

Gross changes in the body can be detected, diagnosed and measured for their severity by modern diagnostic tools very effectively. However, subtle changes in the Pranamaya and manomaya koshas where diseases originate , go undiagnosed by modern diagnostic tools.
Table 3.1
Comparison of different learning / behavior disorder

Normal : +, Good : ++, Excellent : +++
Deviant : -, Severe : --, Highly deviant : ---

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Variable</th>
<th>ADHD</th>
<th>Down’s Of MR</th>
<th>ASD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sense perception (MANAH)</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>IQ (BUDDHIH)</td>
<td>+++/+/-</td>
<td>-</td>
<td>+/+++</td>
</tr>
<tr>
<td>3</td>
<td>Memory (CHITTAH)</td>
<td>-</td>
<td>---</td>
<td>+/+++/++++</td>
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<tr>
<td>4</td>
<td>Emotions (BHAVANA)</td>
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<tr>
<td>4.1</td>
<td>Negative emotions - aggressive</td>
<td>-</td>
<td>+/-</td>
<td>+/-</td>
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<td></td>
<td>Self injurious</td>
<td>+</td>
<td>+/-</td>
<td>--</td>
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<tr>
<td></td>
<td>Agitation-Meaningful</td>
<td>+</td>
<td>+/-</td>
<td>--</td>
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<tr>
<td></td>
<td>Meaningless</td>
<td>+</td>
<td>+/-</td>
<td>--</td>
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<tr>
<td>4.2</td>
<td>Positive emotions</td>
<td>+/-</td>
<td>++</td>
<td>+/-</td>
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<td></td>
<td>Happy-Meaningful</td>
<td>+/-</td>
<td>++</td>
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<td></td>
<td>Meaningless</td>
<td>+</td>
<td>+/-</td>
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<tr>
<td></td>
<td>Socializing</td>
<td>+</td>
<td>++</td>
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<tr>
<td></td>
<td>Loving</td>
<td>+</td>
<td>++</td>
<td>+/-</td>
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<tr>
<td>5</td>
<td>Creativity</td>
<td>+</td>
<td>--</td>
<td>+++</td>
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<tr>
<td></td>
<td>(SRJANASHEELATA)</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Music, Art, Dance</td>
<td>+/-</td>
<td>+/-</td>
<td>+/-</td>
</tr>
<tr>
<td>6</td>
<td>MOTOR (KARMENDRIYA)</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Stereotypy</td>
<td>+++</td>
<td>+</td>
<td>---</td>
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<tr>
<td></td>
<td>Repetitive movements</td>
<td>++</td>
<td>++</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Co-ordination, Dexterity</td>
<td>-</td>
<td>--</td>
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GUNAS

| TAMAS | Sleep | +     | +     | +     | -       |
|       | Dullness | +     | -     | --    | +/-     |
|       | Lethargy | +     | --    | ---   | +/+/-   |
|       | Obstinate | -     | --    | --    | ---     |
|       | No touch with reality | +/-   | --    | --    | ---     |
|       | Uncontrollably destructive | +/-   | -     | --    | +/-     |
| RAJAS | Aggressive | +/-   | +/-   | -     | +/-     |
|       | Restless | -     | -     | --    | ---     |
|       | Unstructured activity | -     | -     | -     | ---     |
| SATVA | Happy | +     | +     | +/-   | +/-     |
|       | Comfortable | -     | +     | +/-   | -       |
|       | Loving | +/-   | ++    | +/-   | +/-     |
|       | Soft | +/-   | +     | +/-   | +/-     |

STATES OF MIND

| 1 | CHANCHALATA | -- | -- | -- | --- |
| 2 | Capacity for EKAGRATA | -- | -- | -- | --- |
| 3 | DHARANA | --- | --- | --- | --- |
2.6.8 Yoga, the science of holistic living

Yoga is a conscious process for elevating ourselves from our animalistic level to normal human levels to become great human beings, super and divine human beings, ultimately reaching divinity itself. While most of us learn through our interactions with the surroundings and with experience, Yoga uses the innate intelligence to grow. This conscious process with intelligence featured by creativity leads to acceleration of one’s growth. The four streams of Yoga - Jnana Yoga, Bhakti Yoga, Raja Yoga and Karma Yoga work at the level of logic/Analysis, emotions, will power and action levels respectively. The innate freedom in all of us, help to grow fast and accelerate our growth. Used at all levels, our life style will change and become holistic. Yoga as a science of Holistic living can manifest more and more power inherently present within all of us can remedy many of the disorders which appear to be essentially heredity or born deficits as ASD, MR, etc.

2.6.9 Yoga and Autism spectrum disorders

Looking at the symptoms of ASD as described in modern medical terminology presented in Chapter 1 of this thesis, it looks that the connection between Annamaya and Manomaya Koshas are impaired. In Schiz also a similar thing happens and often Autism is called as childhood Schizophrenia. The mind instead of flowing down through the pranamaya Kosha to Annamaya Kosha, gets stuck into a whirl pool like Obsessions. The mind is in its transition to full Rajas from Tamas at this stage. It has the dimension of activity going on in one hand and has an element of stagnation of Tamas on the other hand, which makes it get stuck into a circle unable to come out of it.
The Bhagavadgita describes this first state as follows:
Dhyayato vishayan punsah sangah teshu upajayate

When mind goes on thinking on a subject or an event it gets attached to that thought stream. This is called attachment. When it gets too strong, it becomes obsession. Like swimmers getting stuck in a swirl and getting sucked down the river. The example of Abhimanyu getting stuck in Chakra vyuha. The children with ASD belong to this category.

The yoga techniques such as pranayama, which bridge the body- mind effectively, are very useful in remedying these problems. To use Yoga at all 5 Kosha levels by bringing awareness will be the best remedy. This is called IAYT- Integrated Approach of Yoga Therapy.

2.6.10 Development of IAYT for ASD

Operations at Annamaya Kosha:
- Anuloma, Viloma Pranayama
- Asanas like Simhasana, Vajrasana, Pashchimotthanasana and its modifications based on the individual child’s need.

Operations at Pranamaya Kosha:
- Pranayama
- Om and A, E, U chanting
- Asanas

Operations at Manomaya Kosha:
- Shavasana
- Deep breathing

Operations at Vijnanamaya Kosha and Anandamaya Kosha:
This was mainly done by parents, while children observed them.
- Meditation
- Bhajans
- Vedantic Talks
- Pranayama with holding of breath
2.7 DESCRIPTIONS OF AUTISM IN PURANAS AND HISTORICAL ANECDOTES

An incident describing the qualities of an autistic child is cited in śankaravijaya which is explained in the following ślokas

This is with reference to one of the disciples of Sri ādi śankara named Hasthamalacharya. ādi śankara was at Kollur, he accepted invitations by brāhmaņas to have Bhikśa (alms or food) at their houses. On such an occasion, he visited a village called Śrī Bali (present day Shivalli). In that village there lived a brāhmaņa, Prabhākara, who was noted for his learning. He had a son, who though appearing quite handsome, behaved rather like an idiot. Other children would call him to play with loud noises, yet he did not go for playing. He never expressed any emotions; had no general knowledge of anything. He used to eat at wrong times or go off food for several days together. He acted according to what he pleases. He did not perform what people asked him to do. Though upanayanam was performed, he did not take to studying the Vedas; instead he preferred to sit around doing nothing; no socializing; no talking; no eye to eye contact; appeared to live in his own world Hearing about ādi śankara's visit to the village, Prabhākara approached the master (ācharya) with a load
of fruits and prostrated before him. He also made his son prostrate before him. Prabhākara explained to ādi śankara that his son behaved rather like an idiot and sat idle throughout the day.

Then, ādi śankara addresses that young boy and asked him ‘who are you?’. The boy suddenly opened his mouth and started talking and replied in 12 verses, the gist of the Advaita philosophy. Thus ādi śankara was immensely impressed with him and accepted him as his disciple. He was named Hastāmalaka (one with the āmalaka fruit in his hand) since the knowledge of the Self was natural to him like an āmalaka fruit in one's hand. ādi śankara took the boy into his party and started towards his next destination.

Another incident is from Gurucharithre. Narasimhasaraswathi, who became a great sage, was not speaking till the age of seven years. He exhibited all the signs and symptoms of an autistic child. One day he made a sign indicating that he should be given the sacred thread through upanayana. Accordingly parents performed his upanayanam and when the father recited the Gayathri mantra in his ears, instantaneously he started speaking and reciting Gayathri mantra. Later on, when he grew up he became a saint.

2.8. Review of literature according to modern science

Causes of Autism

A theory of causation is still incomplete. Many still believe in the psychogenic causation, most authorities in the field agree that neurobiological and environmental factors are of crucial importance in terms of causes of autism. A review of literature on causation is somewhat disappointing as the exact cause(s) remain unclear. A variety of causes have been listed in the literature studied, as given below.

2.8.1 Neuropsychological theory

Studies on neuropsychological factors is based on two hypotheses, the first, which considers a primary cortical dysfunction in autism, emphasizes the autism symptoms of language and communication and assumes an under lying specific cognitive disorder, more specifically, a disorder of hemispheric lateralisation; i.e. the
natural substrates in the left hemisphere necessary for sequential forms of information processing fail to develop.

The second hypothesis proposes a primary brainstem dysfunction in autism. This hypothesis based on the observation of the impaired ability of children with autism in modulating their own responses to sensory input and consequently their own motor output. The cortical dysfunction hypothesis of autism has received some support through EEG, vestibular nystagmus studies and brainstem auditory evoked-potential studies. (Tsai LY, 1999 [24])

2.8.2 Neurochemical theory

Studies of neurochemical factors indicate a surge in interest as other studies have failed to show any gross brain pathology, suggesting that microscopic or functional factors may be responsible for autism. There is now evidence supporting the notion that abnormal behavior involves abnormal neural communication in the form of abnormal metabolism or function of neurotransmitters. Serotonin, Dopamine, epinephrine and norepinephrine studies reveal variety of neurochemical abnormalities in autism, the neurochemical variables being examined are usually collected from blood or urine samples which are rather remote from either brain function or structure. Thus the meaning and significance of the findings are not clear. (White BB, 1987 [25])

2.8.3 Neurobiological theory

Neurobiological causation theory is based on the observation that 3 out of 4 individuals with autism demonstrate lower cognitive functioning, severe impairments in speech-language development, associated neurological conditions like epilepsy, sensory impairments, hypo or hypertonic, disturbances in body schema, clumsiness, abnormal posture and gait, emotional facial paralysis, strabismus, and dystonic posturing of hands and fingers. (Tsai LY, 1999 [24], Rutter M et al 1996 [26])

There has been a great deal of speculation regarding the role of “mirror neurons” and autism. The mirror neuron system (MNS) theory of autism hypothesizes that distortion in the development of the MNS interferes with imitation and leads to the core features of social impairment and communication difficulties. The MNS operates
when an animal performs an action or observes another animal perform the same action. The MNS may contribute to an individual's understanding of other people by enabling the modeling of their behavior via embodied simulation of their actions, intentions, and emotions (Williams JHG, 2008\textsuperscript{[27]}). Several studies have tested this hypothesis by demonstrating structural abnormalities in MNS regions of individuals with ASD, delay in the activation in the core circuit for imitation in individuals with Asperger syndrome, and a correlation between reduced MNS activity and severity of the syndrome in children with ASD (Iacoboni M et al, 2006\textsuperscript{[28]}). However, individuals with autism also have abnormal brain activation in many circuits outside the MNS (Frith U, 2003\textsuperscript{[29]}) and the MNS theory does not explain the normal performance of autistic children on imitation tasks that involve a goal or object (Hamilton AF, 2008\textsuperscript{[30]})

There are very few studies reported on neuropathology. Bauman and Kemper (1994)\textsuperscript{[31]} believe that the cerebellar cortical abnormalities have their onset prior to birth, 30 weeks of gestation. But this is not supported by any \textbf{neuroanatomical studies}. Neuro imaging studies with emphasis on brain functions such as blood flow, metabolism, and receptor activity utilizing FMRI, MRS, PET and SPECT have not yielded any link between any cerebellar function and autism. (Tsai LY, 1999\textsuperscript{[24]})

\textbf{2.8.4. Structural and functional abnormalities of brain}

\textbf{Many immunological studies} have been reported suggesting that depressed immune function and autoimmune mechanism or faulty immune regulation may be associated with the etiology of autism. However, the interpretation of the reported data is hampered by the conceptual and methodological differences in the studies; but the clinical significance of immune changes and autistic symptoms remain to be elucidated by more extensive studies. (Zager D, 2005\textsuperscript{[32]})
2.8.5 Genetics and ASD

Genetic study in autism is complex. Linkage analysis has been inconclusive; many association analyses have had inadequate power. More than one gene may be implicated; different genes may be involved in different individuals; and the genes may interact with each other or with environmental factors. (Freitag CM, 2007 [33])

Though autism's genetic factors explain most of autism risk, they do not explain all of it. A common hypothesis is that autism is caused by the interaction of a genetic predisposition and an early environmental insult. Several theories based on environmental factors have been proposed to address the remaining risk. Some of these theories focus on prenatal environmental factors, such as agents that cause birth defects; others focus on the environment after birth, such as children's diets.

2.8.6 Vaccination as cause of Autism

The issue of Thimerosal-containing vaccines as a possible cause of autistic spectrum disorders (ASD) and neurodevelopmental disorders (NDDs) has been a controversial topic since 1999. Although most practitioners are familiar with the controversy, many are not familiar with the type or quality of evidence in published literature that has addressed this issue. To assess the quality of evidence assessing a potential association between thimerosal-containing vaccines and autism and evaluate whether that evidence suggests accepting or rejecting the hypothesis, Parker SK et al systematically reviewed published articles that report original data pertinent to the potential association between thimerosal-containing vaccines and ASD/NDDs. (Parker SK et al 2004 [34]) and found what there was no connection between vaccination and autism???
2.8.7. Environmental factors

There is an association between various prenatal risk factors and autism (Larsson et al., 2005 [36], Wilkerson et al., 2002 [37]). No specific or consistent link between pre-, peri-, or neonatal complications and autism (Hultman et al., 2002 [41]).

In conclusion, it may be said that most of the studies are flawed by lack of replicability, sample size, and methodological limitations.

2.8.8. Others

2.8.8.1 Studies of other biomedical factors

Studies on other biomedical factors reveal linkage between gastrointestinal abnormalities, food allergy, pesticides, folic acid, vitamin deficiency, lead and mercury poisoning (Thiomersal) and Autism (Horvath K et al., 1999 [35]).

More research is needed to determine what environmental factors influence susceptibility to autism and to what extent. There is an association between various perinatal risk factors and autism (Larsson et al., 2005 [36], Wilkerson et al., 2002 [37]). Contradictory reviews contend that there is no specific or consistent link between pre-, peri-, or neonatal complications and autism (Nelson KB, 1991 [38]). Additionally, prenatal, and peri-natal risk factors are difficult to analyze independently of whether they impinge upon an already compromised infant, or combine with genetic predisposition to lead to developmental disturbances during growth.

There is also a strong association between the psychiatric history of parents and autism. These findings are, of course, sensitive to comparison group, method of evaluating psychiatric illness, and are generally inconsistent (Yirmiya N and Shaked M, 2005 [39]).

In conclusion, most of the studies are flawed by lack of replicability, sample size, and methodological limitations. Researchers in the field have behaved like the blind persons who are eager to tell the world about the part of the elephant they have touched, although their reports may not tally.

Today it is widely accepted that there is an organic basis for autism. Support for this suggestion is based on evidence of neurological impairments and genetic involvement in autism. Neurologically there is an elevated rate of epilepsy in
individual with Autism, abnormalities of brain function as reflected in abnormalities of EEG, visual and auditory evoked potentials and brain imaging. In addition, macrocephally, abnormalities in cerebellar histology and various brain mal functions have been described in Autism.

2.8.8.2 Theory of mind

It is the understanding that all individuals have “minds” of their own, and are therefore capable of independently developing their own needs, accounts of a situation and beliefs. Theory of Mind was attributed to autism in the mid eighties. Autistic individuals have difficulty understanding that other people maintain separate minds with independent beliefs, needs and intentions. As a result, they cannot evaluate the effect of their behaviors on others in the social environment. (Baron-Cohen S et al., 1985 [40]).

2.9 Management of ASD
2.9.1 Applied Behavior Analysis (ABA)

Applied Behavior Analysis (ABA) has been the most popular, scientifically validated educational intervention model. Interventions based on applied behavior analysis (ABA) focus on teaching tasks one-on-one using the behaviorist principles of stimulus, response and reward, and on reliable measurement and objective evaluation of observed behavior. There is wide variation in the professional practice of behavior analysis and among the assessments and interventions used in school-based ABA programs. Many interventions rely heavily on discrete trial teaching (DTT) methods, which use stimulus-response-reward techniques to teach foundational skills such as attention, compliance, and imitation. However, children have problems using DTT-taught skills in natural environments. In functional assessment, a common technique, a teacher formulates a clear description of a problem behavior, identifies antecedents, consequents, and other environmental factors that influence and maintain the behavior, develops hypotheses about what occasions and maintains the behavior, and collects observations to support the hypotheses. A few more-comprehensive ABA programs use multiple assessment and intervention methods individually and dynamically.
ABA has demonstrated effectiveness in several controlled studies:

Most recently, Remington et al., (2007) [42] compared the effectiveness of early intensive behavioral intervention (EIBI) with a standard 'eclectic' preschool provision. Results showed that EIBI led to significant, positive changes amongst the children with autism, including gains in intelligence, language and daily living skills, as well as in motor and social skills. In addition, these positive changes in children were achieved without negative impact on the psychological wellbeing of parents. Remington et al. argue that further research is required to identify factors that best predict the effectiveness of the intervention, factors that increase its impact, and factors that ensure its benefits are maintained in the longer term.

Reed, Osborne & Corness (2006) [43] compared home-based interventions for young children using applied behavior analysis models. Hi-intensity (mean of 30 hours per week) and low-intensity (mean of 12 hours per week) applications were compared. Children in the high-intensity group made more gains in educational progress and cognitive functioning that the children in the low-intensity group. Additionally, when the three types of hi-intensity applications were compared, the CABAS[R] approach was found to produce superior gains "...in terms of statistical significance and effect sizes..."

Case studies have been documented in which independent evaluators used objective measurement instruments to track children's progress (Green, Brennan, & Fein, 2002 [44]; Perry, Cohen, & De Carlo, 1995 [45]). For example, Perry et al. report the effectiveness of early intensive behavioral intervention with two siblings with autism diagnoses. The intervention involved up to 35 hours of intensive 1:1 teaching sessions. Professionals who diagnosed the children evaluated their progress systematically and reported that both no longer met the criteria for diagnosis of autism.

ASD children have been shown to make sustained gains in academic performance, adaptive behavior, and language, with outcomes significantly better than control groups. A 2008 review of educational interventions for children, whose mean age was six years or less fat intake, found that the higher-quality studies all assessed ABA, that ABA is well-established and no other educational treatment is considered probably-efficacious, and that intensive ABA treatment, carried out by trained therapists, is
demonstrated effective in enhancing global functioning in pre-school children. A 2008 evidence-based review of comprehensive treatment approaches found that ABA is well-established for improving intellectual performance of young children with ASD. A 2008 comprehensive synthesis of early intensive behavioral intervention (EIBI), a form of ABA treatment, found that EIBI produces strong effects, suggesting that it can be effective for some children with autism; it also found that the large effects might be an artifact of comparison groups with treatments that have yet to be empirically validated, and that no comparisons between EIBI and other widely recognized treatment programs have been published. (Skinner, 1950 [46] )

2.9.2 Concept of Integrated Approach to Yoga Therapy

Yoga therapy is that facet of the ancient science of yoga that focuses on health and wellness at all levels of the person, physical, psychological and spiritual. Yoga therapy focuses on a path of yoga as a healing journey that brings balance to the body and mind. The healing journey is unique to each individual and yoga therapy therefore selects, adapts and modifies the practices of yoga appropriately for the individual with respect to age, culture, religion, and specific physical challenges and conditions to facilitate optimal health and healing of the body/mind. Yoga is more than an adjunctive therapy as it is practiced throughout a lifetime. Therapies are generally discontinued after a particular condition is corrected. In the case of ASD children, Yoga needs to be practiced all through their lifetime.

2.9.3 Why Integrated Approach to Yoga Therapy (IAYT)?

Some research studies indicating the beneficial aspect of yoga have been reported. Health benefits of yoga are grouped under three categories - physiological, psychological and biochemical.

There have been some studies reporting the efficacy of IAYT in special children. Uma, et al [47] assessed the effect of IAYT on IQ, in Mentally Retarded (MR) children in a one year controlled study. 90 children with MR of mild, moderate and severe degree were selected from four special schools in Bangalore, India. 45 children underwent yogic training for one academic year with an integrated setup of yogic
practices, including pranayama, asanas and meditation. Significant improvement was reported in the IQ and social adaptation parameters in the yoga group compared to the control group.

Pag F et al 2001 [48] reports one controlled open trial led by Michael Linden, in 1996, with Attention Deficit Hyperactivity Disorder (ADHD) children. Result showed a 9-point IQ increase over a 40-week period.

In a study reported by Harrison J (2004) [49], 48 children with ADHD were subjected to a family treatment method using the techniques of Sahaja Yoga Meditation (SYM). Parents and children participated in a 6-week programme of twice-weekly clinic sessions and regular meditation at home. Pre- and post-treatment assessments included parent ratings of children’s ADHD symptoms, self-esteem and child–parent relationship quality. Perceptions of the programme were collected through parent questionnaires and child interviews. Results showed improvements in children’s ADHD behavior, self-esteem and relationship quality. Children described benefits at home (better sleep patterns, less anxiety) and at school (ability to concentrate, reduced conflict). Parents reported feeling happier, less stressed and manage their child’s behavior better. Indications from this preliminary investigation are that SYM may offer families an effective management tool for family-oriented treatment of childhood ADHD.

Telles S et al [50], in her review of literature on yoga for rehabilitation, reports that yoga practice benefited MR children by improving their mental ability, motor coordination and social skills. Physically handicapped subjects had a restoration of some degree of functional ability after practicing yoga. Visually impaired children showed a significant decrease in their abnormal anxiety levels when they practiced yoga for 3 weeks, while a program of physical activity had no such effect.

There have been studies reported on the effect of Uni-nostril breathing on cognitive performance. A study was done with 127 subjects, using breathing through dominant uni-nostril and Forced Uni-Nostril Breathing (UFNB). This showed that there was a tendency for subjects exhibiting base-line right nostril dominance to perform verbal task better (relative to special performance) than subjects exhibiting left nostril dominance. These results showed that at least in base-line (not forced breathing)
condition the functions of the contra lateral hemisphere are enhanced. This observation is supported by an earlier investigation where in unilateral forced nostril breathing influences spatial and verbal performance in both males and females. (Block RA et al [51]).

Jella SA et al [52] studied the effects of unilateral forced nostril breathing on cognitive performance. This study describes the effect of 30-minutes of unilateral forced nostril breathing on cognitive performance in 51 right-handed under graduate psychology students. A verbal analogies task modeled after the Miller Analogies and SAT tests was used as a test of left-hemispheric performance and a mental rotation task based on the Vandenburg and Kuse adaptation of Shepared and Metzler’s test were used as a spatial task for testing right-hemispheric performance. Spatial task performance was significantly enhanced during left-nostril breathing and verbal task performance was greater during right nostril breathing.

2.9.4 EFFECTS OF MEDITATION ON THE BRAIN

One key aspect of using yoga is that it not only involves postures, but also requires breathing techniques that stimulates concentration in the brain. There are several studies that have used specific meditation techniques for children and families with and without disabilities.

Werntz D et al (1983) [53] performed a qualitative research study that examined hemispheric functions after implementing selective nostril breathing. The concept was to see if controlling the breathing of one nostril would impact the cognitive functioning in the brain.

The methodology for conducting the experiment was first to measure the airflow of the nostrils through a unit called a thermistor. Airflow was measured in conjunction with an EEG for brain activity to see where the brain activity was occurring. A baseline of activity from the nostrils was measured in order to normalize the current airflow for each individual. Further, it was noted which nostril produced the majority of the airflow, so a more accurate airflow could be determined for the dominant nostril. The baseline would then be compared to altering nostril breathing and cerebral hemispheric activity.
The length of the recording was determined by the subject’s ability to stay awake and remain immobile.

The results indicate that hemispheric activity is correlated with airflow in the opposite nostril. The significance of this work is that students with ADHD are believed to have specific hemispheric activity on one side of the brain that constantly keeps them active. Thus, depending on which side of the brain is more active, students can be taught to decrease their breathing activity on the controlateral nostril and increase their breathing using the other nostril. This would create more of a balance in the two brain hemispheres. As a result of the study, cognitive processes and behavior may be influenced by regulation in breathing patterns depending on the location of activity in the brain.

In a follow up study conducted by Werntz D et al (1987) [54] the authors confirmed that cognitive performance was correlated with forced breathing through the controlateral nostril. Using the same methodology, they determined that by having a subject breathe through one nostril, it generated more activity on the opposite side of the brain. Thus, verbal skills were enhanced while the subjects were breathing primarily out of their right nostril and spatial skills were enhanced during left nostril dominance. Breathing techniques have been shown to be effective in conducting more activity in the brain, thus increasing concentration and academic performance.

Similarly, in a review of the literature by Zipkin D (1985) [55] it was shown that relaxation techniques have been extremely effective for children with disabilities. Research indicated that progressive muscle relaxation, isometrics, yoga, movement exercises, massage, guided fantasy, meditation, concentration, music, breathing control, and biofeedback training have all been successful at decreasing hyperactivity and impulsivity. At the same time, academic achievement, interpersonal relationship, and increased attention span have resulted from these techniques. The yoga research as described in Zipkin’s (1985) [55] review suggested that yoga positively effects mental states. It promotes self-control, attention, and concentration through breath control, and deep relaxation.

Additional research has shown that with deep breathing, the body’s overall circulation is improved resulting in the release of tension as well as increasing levels
of blood and oxygen through the entire body, which then affects the central and autonomic nervous systems. Both systems control heartbeat, respiration, and conserve energy. Through breath and meditation, yoga works to produce calming effects, emotional balance, and increases concentration (Harrison J et al 2004 [48]; Pag F et al 2001 [49]; Peck H et al 2005 [56]; Shannahoff-Khalsa D, 2004 [57]; Zipkin D, 1985 [55]).

Harrison J et al 2004 [48] used Sahaja Meditation for families of children with ADHD and showed positive results with both children with ADHD and their parents. In this research, families participated in a Sahaja meditation program for duration of 6 weeks, for two days each week in a clinic session. The sessions each lasted 90 minutes. Children and parents contributed to the data collection, which consisted of several questionnaires, examiner testing and interviews, medication checks, and self-esteem measures. Data were collected throughout the treatment in weeks 1, 3 and 6. Results indicated significant improvements in children’s self-esteem, academic achievement, parent-child relationships, and a reduction in several symptoms of ADHD. Based on the results, anxiety, poor confidence, hyperactivity, and impulsivity were significantly reduced over the course of the meditation treatment. At some points, children either quit or reduced the use of stimulant medication because they felt more in control of their bodies. The research indicated children who either quit taking or reduced medication showed more improvement in ADHD-related behaviors than those who continued to take their medication.

In a single study reported at Orange County school CA, with 8 children diagnosed with ASD, heart rates were measured, pre and post yoga sessions and correlated with improved test scores in certain skill areas such as turn taking, receptive language following verbal directions, body awareness and proximity, following routines, regulating and self monitoring. (Conner C, 2005 [58]).

A study reported by Oldenburg L (2004) [59] with ASD children reports increased concentration, focus, organization and relaxation after 25 yoga sessions.

Studies quoted above suggest that yoga may have merit as a complimentary treatment but remains as an investigational treatment despite positive results reported,
methodological and procedural problems raise questions about the efficacy of the practice with young children.

IAYT is ideal for ASD population because of the prevalence of social behavioral, cognitive and neurobiological deficits. It was observed that preference for repetitive movements that stimulate the vestibular system, such as spinning and swinging, sudden mood changes, under responsiveness to spoken language, temper tantrums, unprovoked aggression, self-injurious behavior, short attention span and hyperactivity reduced dramatically with yoga. This is only an observation. There has not been any scientific study regarding the efficacy of IAYT with ASD children. This study will provide a scientific basis and technical framework for simultaneously investigating multiple domains of cognition, their relationship to symptomatic behaviors and subsequent improvement over these behaviors.

2.9.5 Theory behind the study

We now know autism is not a unitary disease with a single etiology. It is a heterogeneous behavioral syndrome found in association with many etiologies. We also know that there is no single treatment or intervention; even the most established methods may not work well for some children. There is no “one size fits all” treatment. There is yet no established protocol for relating specific child, family, and target behavior and treatment variables to individualized treatment regimens. Recent research regarding brain function in autism suggests core deficits in functions that are thought to be controlled by cortical structures in the brain.

Dysfunction of reticular brain stem mechanisms and their projection to higher centers could account for autistic person’s inability to modulate sensory input, resulting in under and over responsiveness to sensory stimuli and impairment in the ability to direct and sustain attention. Given autistic impairment in social understanding, the disorder may involve dysfunction in the limbic system, particularly cells in the amygdale that are responsive to social-emotional stimuli. Dichotic listening studies confirm that the right hemisphere is overactive in persons with autism; stimuli that evoked left hemispheric responses in normally developing individuals evoke right hemispheric responses or a lack of response. Several studies of autonomic
(cardiovascular) responses to novel stimuli have suggested that autistic individuals show abnormal orienting responses; they react to mild novel stimuli as if they are averse to heart rate acceleration and less habituation. Compared to normal children, autistic children have elevated heart rates, increased peripheral blood flow, and greater heart rate variability. Such over arousal was thought to interfere with autistic person’s ability to process and interpret information, contributing to deficits in language and social understanding. The pervasive nature of autism suggests that dysfunctions must occur in both cortical and sub cortical areas of the brain. Based on many years of observation and working with children diagnosed with ASD, it is natural to hypothesize that these children may have specific deficits in the frontal lobe and generally involving cortical and sub cortical areas of the brain. It is therefore seemed logical that working directly to improve the function of the brain (the likely cause) might improve the observed behaviors more efficiently, than the more conventional model of focusing on the problem itself (the symptoms).

IAYT to ASD children is focused to capitalize on the positive effects of Yoga involving Asanas (physical posture), Pranayama (voluntary regulated breathing/normal functioning at the subtle energy level), Healthy yoga diet, loosening exercises & Relaxation techniques to directly affect frontal lobe efficiency, thereby increasing physical and cognitive functions of children with ASD.